Dräger

Evita 2 dura Service Plus

Supplement to
the Instructions for Use
of the Evita 2 dura

1-251-96

Contents

For Your Safety and That of Your Patients

Strictly follow the Instructions for Use

Use of the apparatus requires full understanding and strict observation of these Instructions and of the Instructions for Use of the Evita 2 dura. The apparatus must only be used for the purposes specified here.

Liability for proper function or damage

The liability for the proper function of the apparatus is irrevocably transferred to the owner or operator if the apparatus is incorrectly serviced or maintained by persons not employed by Dräger Service or if it is handled in a manner not conforming to its intended use.

Dräger cannot be held liable for damage caused by non-compliance with the recommendations given above. The warranty and liability provisions of the terms of sale and delivery of Dräger are likewise not modified by the recommendations given above.

Dräger Medical AG & Co. KGaA

Intended Use

Evita 2 dura Service Plus

Machine diagnostics with device status display

Device status checking and fault analysis

Structured display:

– switching and operating states of actuators, e.g. valves,
– calibration values/measured values of sensors,
– fault lists,
– test results,
– component types/data.

Only suitably qualified personnel, e.g. Dräger Service technicians, may use Service Plus and carry out repairs to the machine.

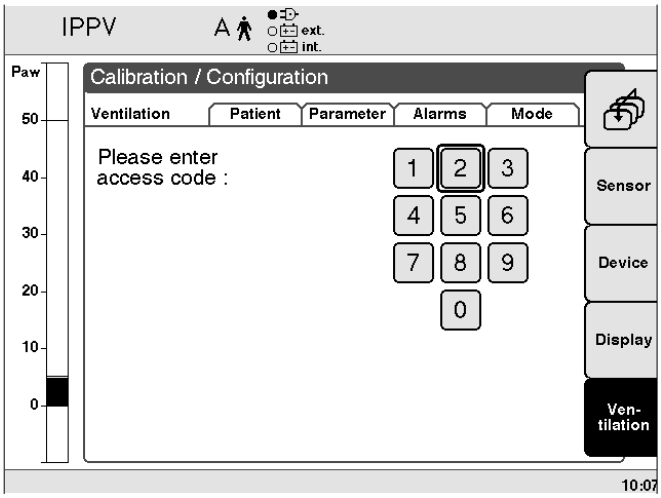
Operation

Switching on Service Plus

Precondition:
Evita 2 dura Software 3.n or higher.
The "Service Plus" option must be installed.

- Press the »**Calib./Config.**« menu key
- Press the »**Ventilation**« menu key

Display example:



- Enter code number »4655«:
  Select the digits one by one
  = turn the rotary control and press to confirm.

- Select the desired diagnostic page with the »**Select ▶▶**« menu key:

  Front

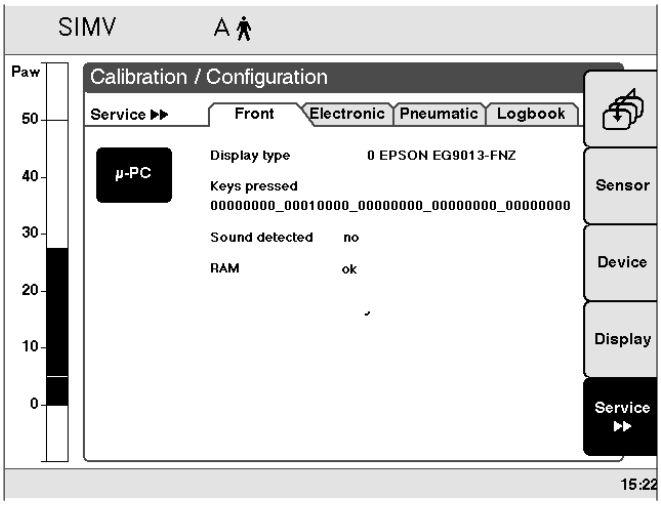
  Electronic

  Pneumatic

  Other

Example display (Front):

The messages are displayed in english.



- To select the sub-groups of the diagnostic page:
  Select the corresponding key on the diagnostic page
  = turn the rotary control,
  confirm = press the rotary control.

  If only two sub-groups are proposed, no need to confirm.
  Press any of the other menu keys to quit the Service Plus function.

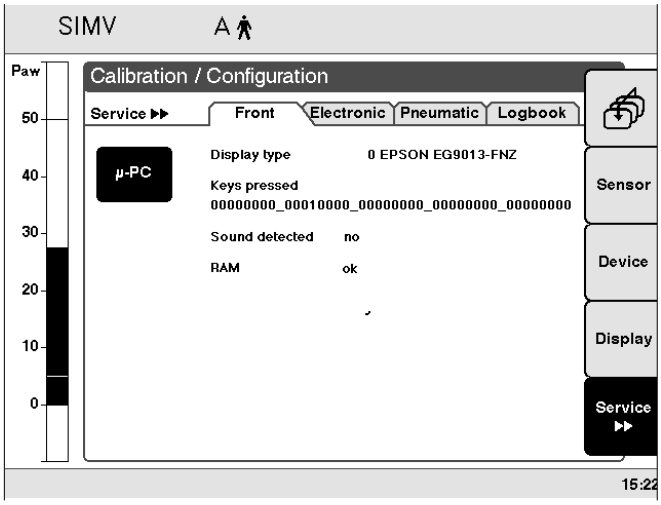
Diagnostic page: "Front"

This page is used to diagnose problems in the apparatus front panel components and for RAM diagnostics.

Disconnect from the patient before use!

The key operating test may affect the ventilation setting.

Example display:



Display type Make/type of screen

Keys pressed Operating test for each individual key of the front panel unit –
Only perform the key test in standby mode with the machine disconnected from the patient.

To perform the test:

- Hold down the relevant key for about 2 seconds:

  1 = key pressed
  0 = key not pressed

Sound detected Operating test of the loudspeaker in the front panel

- To test the speaker, trigger an alarm.

As soon as the alarm is detected, the message "yes" is displayed on the screen.
For up to 10 seconds after the end of the alarm, "yes" remains displayed in order to detect even short tones.

yes = loudspeaker function OK

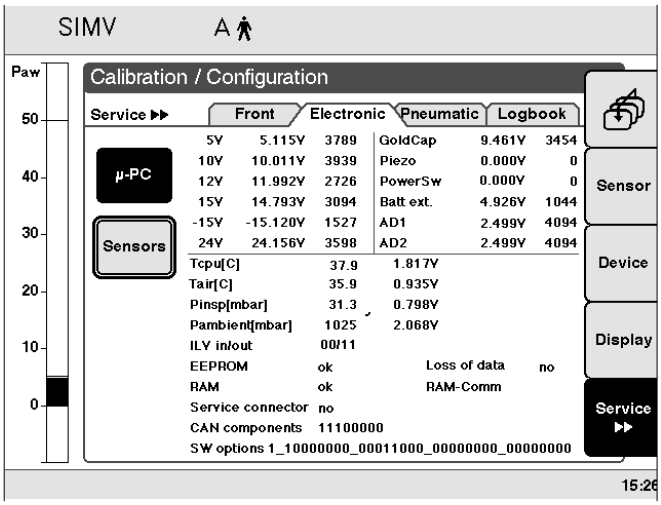
no = loudspeaker faulty

RAM ok = RAM test successful

Diagnostic page: "Electronic µ-PC"

This page displays the characteristics of the electronic section and electronic components.

Example display µ-PC:



5 V
10 V
12 V
–15 V
24 V

Power pack voltage values measured on the "CO_2 Carrier" card

Column 1: Rated voltage in V

Column 2: Measured voltage in V

Column 3: Decimal AD-converter values

Gold Cap — Actual voltage of the gold cap capacitor in V and as decimal AD-converter value

Piezo — Voltage across the piezo alarm unit (redundant alarm signalling to the loudspeaker) in V and as AD-converter value

Power Sw — Voltage across the auxiliary contact of the power switch in V and as decimal AD-converter value. This voltage is used as criterion for power failure.

Power switch on <0,100 V <164
Power switch off >0,312 V >512

Batt. ext. — Voltage of the externally connected DC power source (option Evita 4 DC for Evita 4 and Evita 2 dura) in V and as decimal AD-converter value.

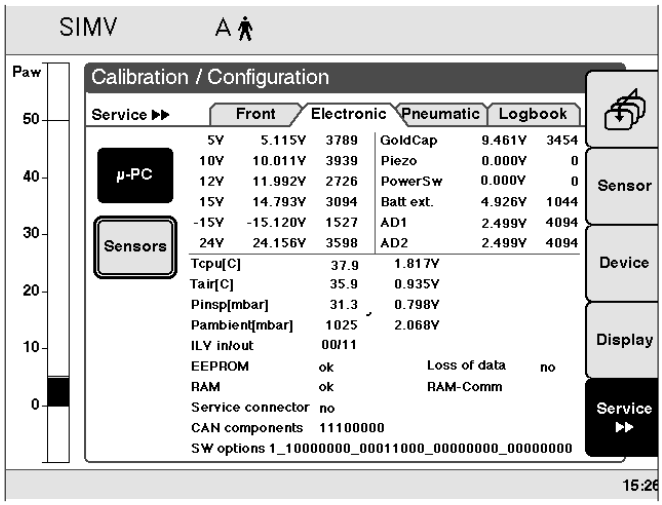
AD 1 — Reference voltage 1 of the AD-converter in V and as decimal AD-converter value.

AD 2 — Reference voltage 2 of the AD-converter in V and as decimal AD-converter value.

Tcpu[C] — Temperature inside the device, measured on the "CO_2 Carrier" card in °C and as a voltage value at the AD-converter in V.

Tair[C] — Temperature of the breathing gas measured with the temperature sensor in the Y-piece of the hose system in °C and as voltage value at the AD-converter in V.

Pinsp[mbar] — Inspiration pressure measured with the pressure sensor located on the expiratory side, expressed in mbar and as voltage value at the AD-converter in V.



Pambient[mbar] Ambient pressure/atmospheric pressure used as reference by Evita 2 dura, expressed in mbar and as voltage value at the AD-converter in V.

ILV in/out Inputs/outputs defined for the "Independent Lung Ventilation" (ILV) option

EEPROM Result of the EEPROM test of the "CPU 68332" card.

RAM Result of the RAM test of the "CPU 68332" card.

Service connector Plug-in connector available for service purposes
yes/no

CAN components Detected internal communication components:

11000000

Screen
Pneumatic system
"Communication" card (interface expansion)

SW options The enabled options are displayed. Output format:

1_(options 0 to 7)_(options 8 to 15)_(options 16 to 23)_(options 24 to 31)

1 = Block 1 with 32 options

1 = Option available

0 = Option not available

The following options for Evita 2 dura are displayed in block 1:

Option 5 = Ventilation Plus

Option 7 = SpO_2 measurement for Evita 2 dura

Option 8 = Capno Plus

Option 9 = DC power adapter for Evita 2 dura

Option 10 = under preparation

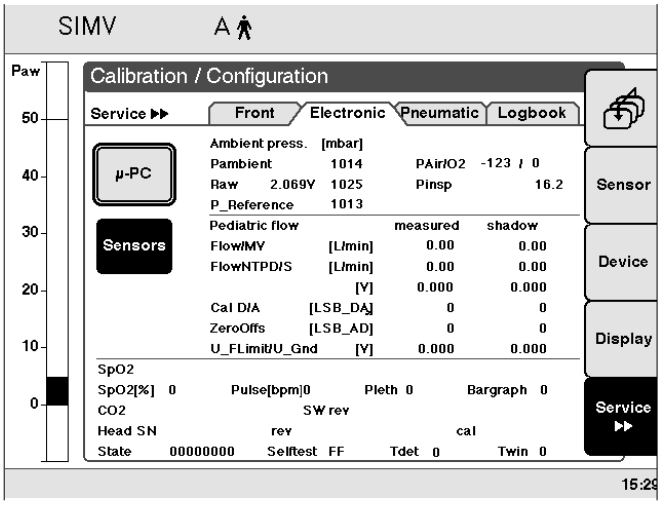
Option 11 = Monitoring Plus

Option 12 = Service Plus

Diagnostic page: "Electronic Sensors"

This page displays the electronic characteristics of the sensors.

Example display:



Ambient press [mbar]

Pambient Atmospheric pressure measured in mbar – filtered value

Raw Actual atmospheric pressure (unprocessed "raw" value – Raw) in V and mbar

P_Reference Reference atmospheric pressure, measured with the pressure sensor for medical air after switching on the apparatus.

P_{Air/O_2} Pressure measured by the upstream pressure sensors in the Air and O_2 connectors during the last device check

Pinsp Inspiratory pressure measured in mbar on the "CPU" (electronic) card

Pediatric flow under preparation

Flow/MV
FlowNTPD/S
Cal D/A
ZeroOffs
UFLlimit/UGnd

SpO_2 Type/value of the SpO_2 module:

SpO_2 [%] functional oxygen saturation in %, measured with the optional SpO_2 measurement for Evita 2 dura.

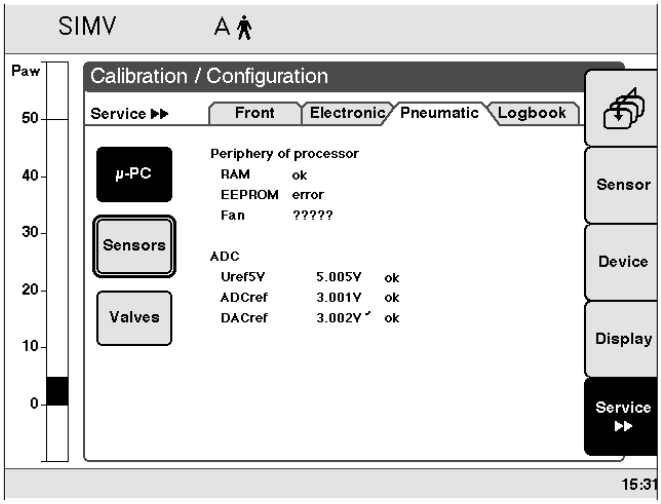
CO_2 Type of the CO_2 module

Head SN Serial No. of the CO_2 sensor

State Status of the CO_2 module

Diagnostic page: "Pneumatic µP"

Example display: µP



Periphery of processor

RAM
EEPROM
Fan

Status of the processor system on the "Pneumatic Controller" card and of the fan for purging O_2 from inside the device.

ADC

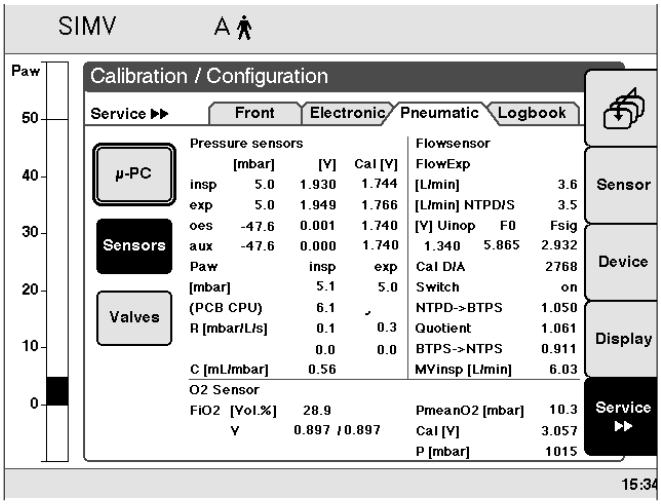
Uref5V
ADCref
DACref

Reference voltage values of the "Pneumatic Controller" card.

Diagnostic page: "Pneumatic Sensors"

This page displays the characteristic data of the pressure sensor, flow sensor and O_2 sensor.

Example display for Pneumatic Sensors:



Pressure sensors Measured values in mbar and V and calibration values in V for the

insp inspiratory pressure sensor and

exp. expiratory pressure sensor

oes not used

aux not used

Paw [mbar] Airway pressure Paw in mbar. Calculated from the measured values of the pressure sensor on the inspiratory side and the pressure sensor on the expiratory side – with correction for hose resistance.

(PCB CPU) Comparative value in mbar. Output voltage of the pressure sensor on the inspiratory side. This value is also loaded on the "CO_2 Carrier" card.

R [mbar/L/S] Inspiratory: hose resistance – from the inspiratory port of the device to the Y-piece, in mbar/L/s

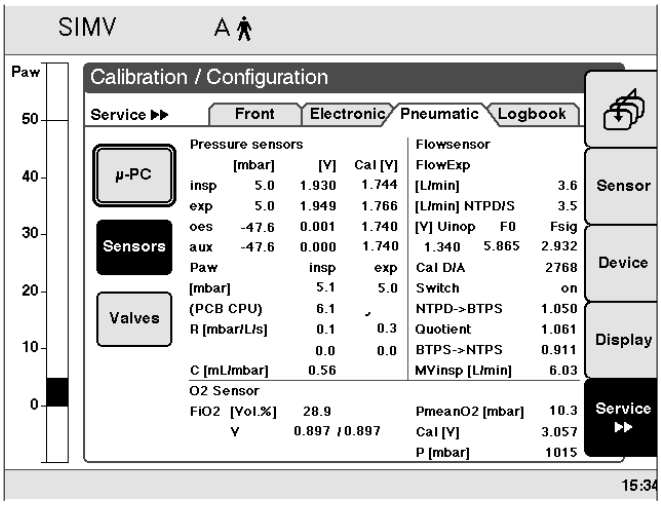
Expiratory: hose resistance from the Y-piece to the expiratory port of the device in mbar/L/s

Upper line: measured by the safety software during operation

Lower line: determined during the device check

These values are measured with different flows.

C [mL/mbar] Inspiratory hose compliance in mL/mbar, determined during the device check.



Flowsensor Measured values from expiratory flow measurement. All values are displayed under BTPS conditions unless otherwise specified.

BTPS
Body **T**emperature
Pressured, **S**aturated:
37 °C, atmospheric pressure + Insp. pressure, 100 % rel. humidity.
All measured values and settings of Evita 2 dura are based on BTPS.

NTPS
Normal **T**emperature and
Pressured, **S**aturated
20 °C, 1013 mbar, 100 % rel. humidity.
Corresponds e.g. to the unprocessed value of the measured expiratory flow.

NTPD
Normal **T**emperature and
Pressured, **D**ry
20 °C, 1013 mbar, dry
The mixer supplies e.g. the flow under these conditions.
The setting of Evita 2 dura under BTPS is converted to NTPD for the mixer.

Flow Exp [L/min] Measured expiratory flow from NTPS to BTPS.
Corresponds to the display value.

[L/min] NTPD/S Unprocessed measured value for "Flow" under NTPD or NTPS conditions.

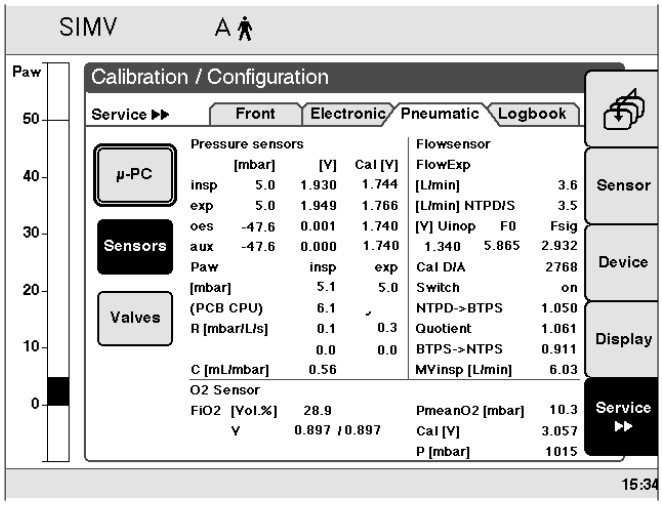
[V] Voltage values of Flow measurement in V:

Uinop Specified voltage values ≥0.1 V: sensor OK if F0 and Fsig OK. If voltage <0.1 V, the message "Flow measurement inop" is displayed.

FO 4x amplified bridge voltage for Flow measurement value.
Specified value in no-flow state = 4.04 V.

Fsig 2x amplified bridge voltage for Flow measurement value.
Specified value in no-flow state = 2.02 V.

Cal D/A Decimal value of the D/A conversion for flow sensor calibration:
Specified value = 2200 to 3200.



Switch Microswitch for detecting the position of the Flow Sensor:
on = Flow sensor in correct operating position
off = Flow sensor not ready for operation, replacement position

NTPS → BTPS Conversion factor,
From unprocessed "measured flow" value under NTPS conditions to the displayed "Flow" value under BTPS conditions.
Permitted deviation from "Quotient" = 5 %.

Quotient Calculated conversion factor from NTPS to BTPS

BTPS → NTPD Conversion factor from Flow BTPS to NTPD.

Mvinsp [L/min] Inspiratory minute volume calculated from the control signals of the mixer. The measured expiratory minute volume must not exceed this value by more than 20 %. If the difference is greater, the message "Flow measurement inop" is displayed. This deviation can be caused by the following faults:

- Flow measurement is defective
- An unauthorised external flow is being fed into the system (e.g. an other medicament nebuliser than described in the Instructions for Use)
- The mixer is supplying an excessive flow

O_2 Sensor Measurement and calibration values for the inspiratory O_2 measurement. The output voltage of the O_2 sensor is amplified directly at the sensor.

FiO_2 [Vol.%] Measured O_2 concentration in % by volume, pressure compensated.

V Amplified sensor voltage at the input of the "Pneumatic Controller" card. The voltage is read off twice from this card. See Cal(V) for the permitted voltage range.

Pmean. O_2 [mbar] Present average pressure in the hose system in mbar. This value is needed for pressure compensation of the O_2 measurement.

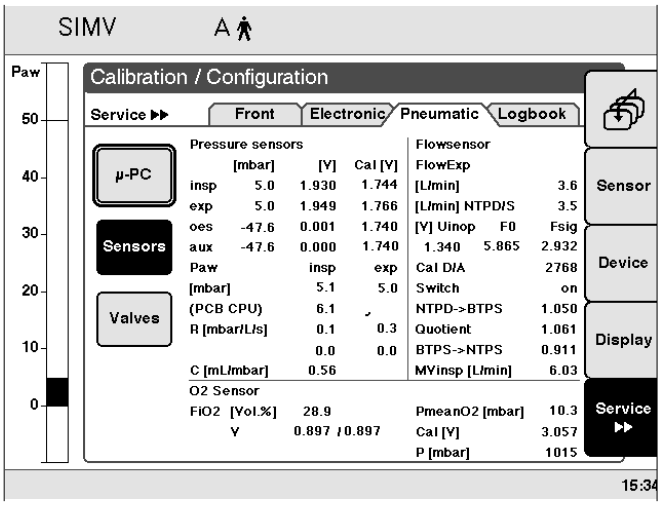
Cal [V] Amplified sensor voltage on calibration with 100 % O_2 by volume.

Permitted range: 1.257 to 5.644 V

Voltage too low:
possible cause: O_2 sensor worn

Voltage too high:
possible cause: O_2 measurement defective (O_2 amplifier or Pneumatic Controller card)

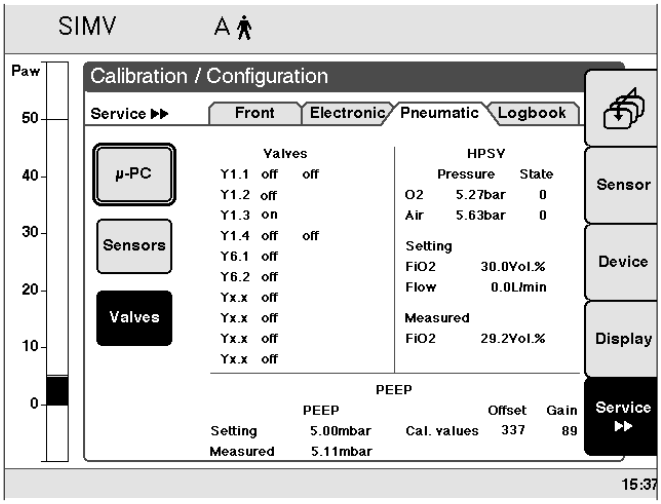
P [mbar] Atmospheric pressure taken into account in mbar during O_2 measurement calibration.



Diagnostic page: "Pneumatic Valves"

This page displays the output states of the pilot valves, the status of the HPSV (High Pressure Servo Valve), the O_2 setting and the PEEP setting.

Display example:



Valves Actuation of the pneumatic pilot valves

off = pilot valve de-energised

on = pilot valve activated

Y1.1 O_2/Air changeover valve
off = switched to air

Y1.2 O_2 measurement calibration valve,
on = O_2 measurement calibration

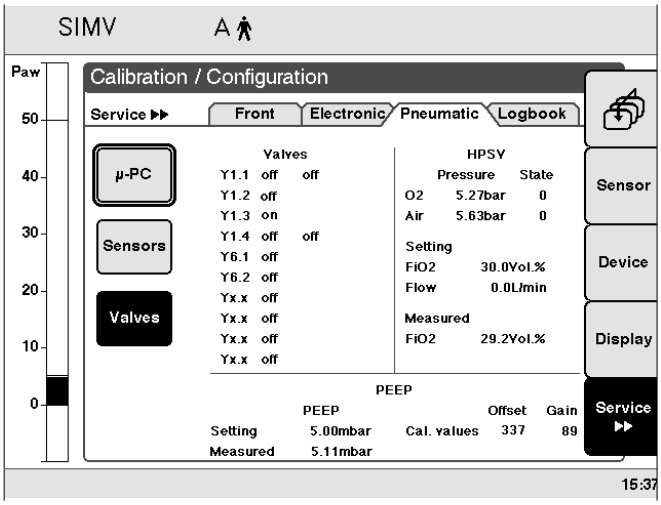
Y1.3 Safety valve
on = Ventilation
off = Safety shutdown activated

Y1.4 Nebuliser valve,
off = Medicament nebuliser off

Y6.1 Calibration valve for inspiratory pressure sensor S6.1,
on = Calibration

Y6.2 Calibration valve for expiratory pressure sensor S6.2,
on = Calibration

Yx.x for future operation



HPSV
O_2
Air

Supply pressures and status reports of the flow metering valve for O_2 and Air.

Pressure:
The absolute pressures for Air and O_2 are displayed in bar.
Absolute pressure = Rel. supply pressure + atmospheric pressure.

Measurement range of the supply pressure sensors =
0 to 7 bar
Sensitivity: 1.58 V / bar ±8 mV
Offset voltage = 300 mV ±30 mV

Status:
Status messages from the relevant "HPSV-Controller" card for O_2 and Air.
0 = No error
2 = Supply pressure less than 2 bar absolute, failure of the pressure supply.
1.3 to 15 = Error on the HPSV Controller card or in the HPSV cartridge.

Setting
FiO2
Flow
Measured
FiO2

The settings for Flow and Fi O_2, and the measured Fi O_2 value are displayed.

PEEP

Values for the PEEP/PIP valve Y4.1

Setting

PEEP setting in mbar

Measured

Measured PEEP during airway pressure measurement, in mbar

Cal. values

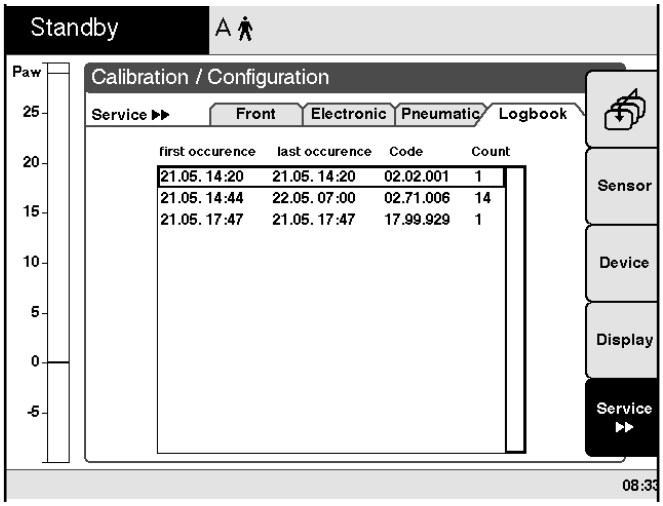
Calibration values for actuating the PEEP/PIP valve.
On replacing the valve or card:

- Carry out calibration by DrägerService.

Diagnostic page: "Service Logbook"

This page displays the error code number list, containing all the recorded software and hardware error messages.

Example display:



Structure of the error code number list

The error code number list records all the device failures (software and hardware) signalled by the safety software.

The following information is recorded:
Code, count, first occurrence, last occurrence.

The error messages are stored in order of their occurrence. The entries are sorted by code. If an error message has already occurred, a new line is not created: instead, only the date of last occurrence is amended, and the count is incremented by 1.

Structure of the error code numbers:

LL = Reference to the components, card or software
NN = Type of error
MMM = Explanation

LL	NN	MMM	Meaning
00	XX	XXX	Normal monitoring. Only recorded in the user logbook.
01	XX	XXX	Settings. Only recorded in the user logbook.
02	01 to 61	001 to 999	Errors detected by the safety software.
	71	001	Loudspeaker not detected.
		002	Flow measurement defective.
		003 to 006	Gold cap capacitor.
		007	BOOT test error.
		008	Auxiliary alarm triggered.
		009	Current across piezo alarm generator too high.
		010	Current across piezo alarm generator too low.
		011	Nebuliser valve monitoring defective.
		012	"Loudspeaker" monitoring circuit reports an error.
		013	"Loudspeaker" monitoring circuit reports an error.
		014	+15 V too low.
		015	+10 V too low.
		016	A/D conversion for O_2 measurement defective.
		017	Actuation of the O_2/Air changeover valve defective.
		018	Incorrect nebuliser gas.
		019	Cold start detection defective.
		020	Hardware initialisation defective.
		021	Quartz times differ.
	72	000 to 006	Errors detected by the ventilation software.
		007 to 070	Errors detected by the ventilation software.
03	XX	XXX	Front panel components.

LL	NN	MMM	Meaning
04	XX	XXX	Electronic system components. Components not mounted on the cards.
	01	XXX	Power adapter
05	XX	XXX	Pneumatic components
	01	XXX	Fan
	02	001	Reset-up line
		002	Reset-down line
		003	Disable line
	04	001 to 004	O_2/Air changeover valve.
06	XX	XX	Extension box Components not yet implemented.
07	XX	XXX	Software error
08	XX	XXX	Future expansion
09	XX	XXX	Other
10	XX	XXX	"Pneumatic Controller" card
11	XX	XXX	"HPSV Controller Air" card
12	XXX	XXX	"HPSV Controller O_2" card
13	XX	XXX	"CPU 68332" card
	98	001	BOOT error
14	XX	XXX	"CO_2 Carrier" card
15	XX	XXX	"Communication" card (option)
16	XX	XXX	"Paediatric Flow" card (in preparation)
17	XX	XXX	"Front panel" card
18	XX	XXX	"Pneumatic Motherboard" card
19	XX	XXX	"Electronic Motherboard" card

These Instructions for Use apply only to
Evita 2 dura with the option "Service Plus"
with Serial No.:

If no Serial No. has been filled in by Dräger these Instructions for Use are provided for general information only and are not intended for use with any specific machine or device.

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Directive 93/42/EEC
concerning Medical Devices

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